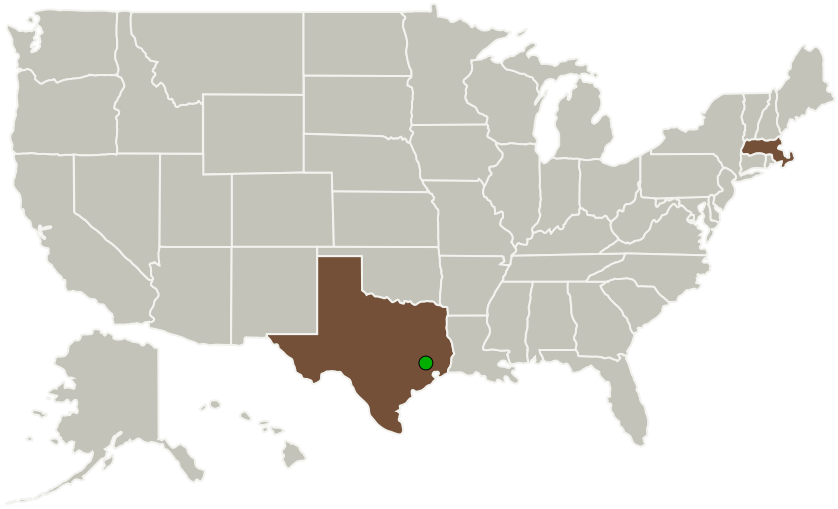
Morphing Upper Torso: A Resizable and Adjustable EVA Torso Assembly, Phase I

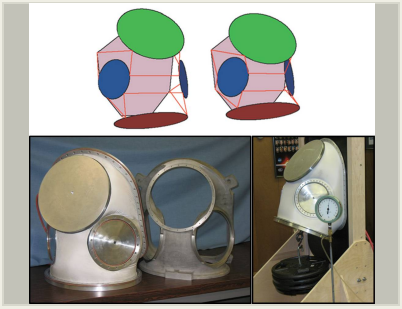
Completed Technology Project (2013 - 2013)

Project Introduction

Traditional Extravehicular Activity (EVA) spacesuits incorporate either hard or soft upper torso subassemblies as part of their architecture. In either case, these components are of a specific, fixed size and lack provisions to make sizing adjustments across the overall envelope of the torso. This project will further the TRL of the prototype Morphing Upper Torso, an innovative pressure garment that allows for resizing of the torso and precise repositioning of the neck, scye and waist planes. The concept has seen significant initial development through the research and PhD dissertation of Dr. Shane Jacobs, the PI on this proposed effort. To date, analytical and experimental models of the full Morphing Upper Torso design (in which the back hatch of a rear-entry torso is interconnected with the waist ring, helmet ring and two scye bearings) have been used to demonstrate the feasibility of this novel space suit concept. The analytical and experimental results demonstrate that the torso could be expanded to facilitate donning and doffing, and then contracted to match different wearer's body dimensions. Using the system of interconnected parallel manipulators, suit components can be accurately repositioned to different desired configurations. The demonstrated feasibility of the Morphing Upper Torso concept makes it an exciting candidate for inclusion in future EVA suit architectures. The proposed project will further the development from the proven concept in a laboratory setting, focusing on integration and development of wearable mockups and ultimately a useable, wearable, pressurizable prototype.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Massachusetts	Texas

Project Transitions

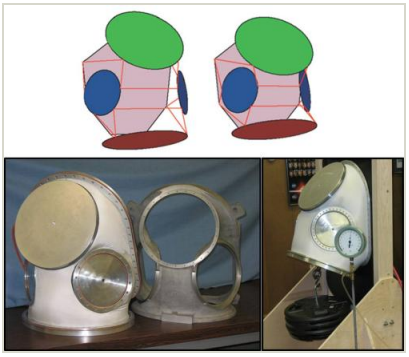
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138328)*

Images



Project Image
Morphing Upper Torso: A Resizable and Adjustable EVA Torso Assembly *(https://techport.nasa.gov/image/133028)*

Project Management

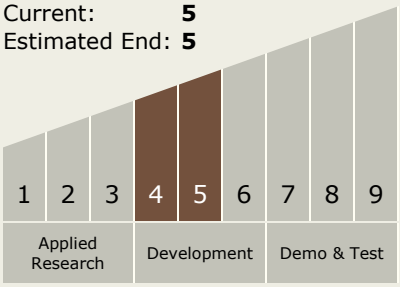
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Shane Jacobs

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.2 Extravehicular Activity Systems
    - TX06.2.1 Pressure Garment

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Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System